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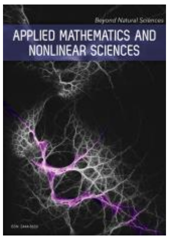

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Informatization of Physical Education Curriculum Education and Training Management in Colleges and Universities under the Maximum Information Entropy Model

Wanli Wang[1,†]

1. Physical Education College of ZhengZhou University, Zhengzhou, Henan, 450000, China.

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Abstract

Currently, there are problems such as weak training purpose, poor training effect and backward auxiliary decision-making means in college physical education. In this paper, we first construct a college sports training management decision-making system based on Multi-Agent and adopt the blackboard model to realize the communication between Agents. The training management decision-making agent system uses the maximum information entropy model to identify the benefits and drawbacks of executing college sports training management decisions. Secondly, feature selection is carried out through the correlation filter (CFS), and the best priority search method is used to obtain the required subset of features. Finally, the reliability of the college sports training management decision-making agent system was verified by testing experiments. The results show that the inter-rater of the system is 0.92<unk>0.95, and the intra-rater is 0.94, reflecting the good reliability and practicality of the training management decision-making Agent system. This study enhances the effectiveness of sports training management to some extent, and it also serves as a valuable reference for the development of similar systems.

Keywords: Multi-agent; Maximum information entropy model; Filter; Training management; Best prioritized search.
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†Corresponding author.
Email address: wwl zyz@sina.com

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1 Introduction

Applied undergraduate colleges and universities in the teaching process of university physical education courses, education and teaching mode reform can help strengthen the comprehensive quality of students, physical education, although it does not directly affect the students' professional performance and skill level, but a good body is the basis for learning and work to improve [1-2]. The education and teaching reform of physical education courses can help to enhance the comprehensive skill level of students but also in the physical education courses to make students enhance the comprehensive quality level to create conditions for other professional courses teaching tasks [3-4]. In the traditional university physical education curriculum, teaching, teaching methods, and teaching content are seriously under-emphasized and not realize the skills that students need to master in the physical education curriculum, as well as the relevant technical measures that need to be continuously strengthened during the learning phase [5-6]. Under the premise of reforming the education and teaching of physical education programs to carry out various teaching tasks, students are not only able to learn a wealth of theoretical knowledge [7]. Through the development of stage-by-stage teaching objectives, students can also experience comprehensive quality improvement and personal sports skills progress in physical education program learning [8-9].

With the progress of science and technology, physical education technology has been progressing in the past 30 years, from electrochemical teaching in the 1990s to the application of multimedia technology. Network teaching began to appear after the rise of the Internet, and then in recent years, large-scale open online courses, mobile APP applications, smart classrooms, etc., which brought a scene of change to education [10]. Literature [11] explores the status quo of aerobics teaching under the construction of information technology, applies microcourses and MOCC resources in the teaching of physical education courses, and carries out a multi-dimensional comprehensive analysis through student questionnaires and in-depth interviews, and the results of the study show that with the help of informatization of teaching and multimedia resources, it makes the quality of teaching and satisfaction of the students to be significantly improved, and it can meet the personalized needs of the students and improves the teaching efficiency. Literature [12] systematic analysis, the performance under the multimedia physical education platform, statistics and analysis, the use of hierarchical evaluation method, combined with process evaluation and summative evaluation. The results of the study showed that the use of multimedia prompted students to be more actively involved in physical education, and the efficiency of teaching was significantly improved. Literature [13], based on artificial intelligence technology, built a framework for analyzing the situation of inverted classrooms in colleges and universities, multi-dimensional observation and evaluation, in order to analyze the operability and rationality, in combination with specific examples. The results of the study show that this method improves the timeliness of classroom feedback, more efficient and in-depth communication between the teacher and the student sides, and the personalized growth of students is a huge help. Literature [14] uses virtual simulation and differential selection, the learning ability of physical education students, through the formula for students to score. The experimental results show that the method has a significant impact on improving the motivation of the students, and interest and learning efficiency are increased tremendously. Literature [15] uses the electronic electrician method to evaluate and analyze the extracurricular sports of college students, and the simulation experiment proves that the method is reasonable and effective and has a positive impact on analyzing and guiding the extracurricular sports of college students. Literature [16] designed a box of friction point nanogenerators (BS-TENG) to convert mechanical energy into electrical energy storage. Different signals can be generated according to different positions during basketball movement, and the presence of the generator allows the device to act as an autonomous motion sensor. Simulation experiments indicate that this design is beneficial for advancing the development of smart devices.

In this paper, firstly, based on the characteristics of sports training management of college students and the characteristics of Agent, Multi-Agent is used to construct the decision-making system of sports training management of college students, and through the interaction state with the decision-makers, the best decision-making management is formulated by the interests, hobbies, and behavioral habits of the decision-makers. Secondly, through the state assessment, decision-making, planning and other contents, Agent behavior modeling, with the help of the maximum information entropy model, to determine the advantages and disadvantages of the implementation of sports training programs. Use the width-first search strategy and forward reasoning for rule inference to obtain the final results for sports training management decision-making. Finally, an experimental validation of the physical education classroom teaching training decision-making agent system was carried out to test its reliability.

2 Design of the Agent system for decision-making in the management of university sports training

At present, the training program and methods of university sports courses are developed by physical education teachers with their subjective will, which makes it difficult to develop a reasonable and effective training program according to the actual situation of the students themselves, thus leading to a low training effect of the physical education courses. This leads to a low training effect of physical education courses, as students' enthusiasm for physical training is not high, which further restricts the improvement of students' physical fitness. Agent technology can operate automatically in a dynamic environment, with a high degree of autonomy of the computer system. The technology can sense the changes in various types of environments and develop a series of adjustment methods. This paper proposes the general framework and specific realization of the decision support system for college students' sports training management based on Multi-Agent technology and analyzes the feasibility and reliability of the system using examples to enhance the effect of college students' sports training management to a certain extent.

2.1 Agent system overall architecture design

Based on the characteristics of college sports training management and the characteristics of Agent, the overall architecture of the decision-making system for college sports training management based on Multi-Agent is shown in Fig. 1. The main function of the Multi-Agent system is to realize the interaction state with the decision-makers, and Multi-Agent is able to proactively survey the relevant information of the management environment and grasp the interests, hobbies, behavioral habits and other contents of the decision-makers. , behavioral habits and other content. When making decisions, Multi-Agent can provide important assistance to decision-making users to ensure that they choose the best decision management system.

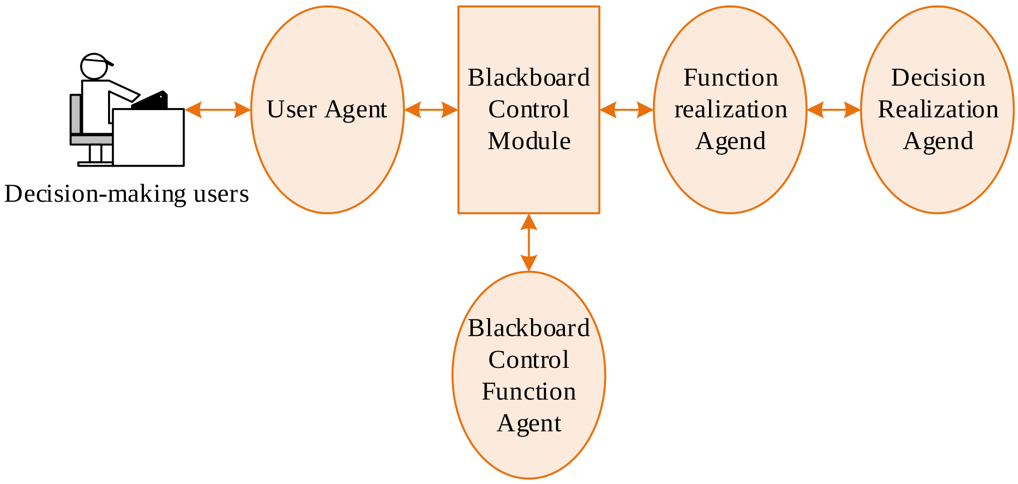

Figure 1. Overall architecture of a Multi-Agent system

The internal details of Multi-Agent include User Agent, Blackboard Control Agent, Function Agent and Decision Agent, and the specific design of these four types of Agents is shown in Figure 2. The Blackboard Control Agent mainly controls the blackboard and other types of agents in the system. This type of Agent can decompose the problem to be solved into a number of sub-problems, assign them to the corresponding level of the blackboard, and manage them according to its own knowledge base and collaboration rules while eliminating conflicts between various types of Agents.

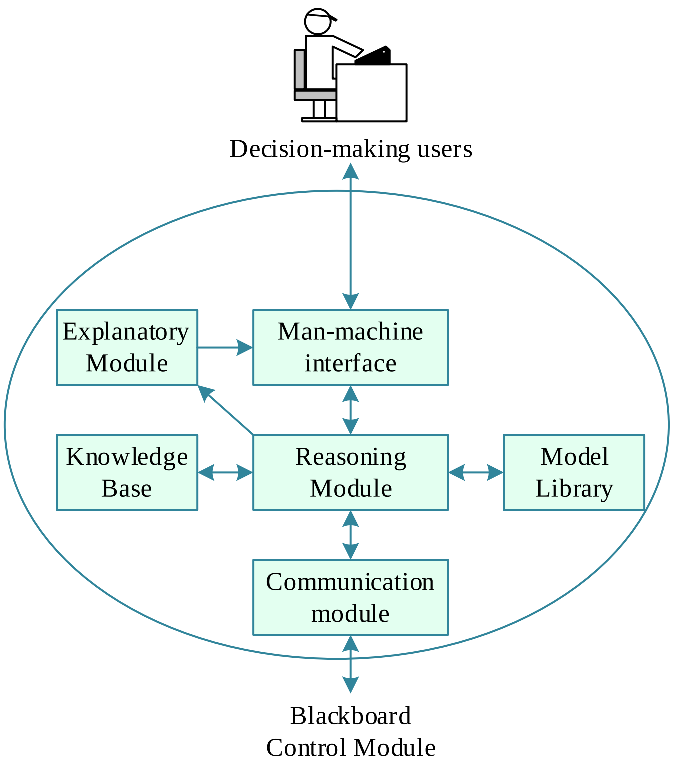

Figure 2. Internal detail diagram of user Agent

Functional Agents are responsible for receiving relevant decision-making tasks and analyzing them to obtain the goals to be solved, and then dividing the relevant goals into a number of small sub-goals and transferring them to their respective Decision Agents for realization.

The Decision Agent is primarily accountable for completing each specific decision task. Each agent in this category corresponds to each decision-maker, and they complete their decision-making through mutual collaboration under the supervision and control of the corresponding functional agents.

2.2 Database design of the Agent system

College athletic training management requires the database system to be an important part of the decision support system (DSS). The database system is mainly composed of a database and a database management system. Compared with a general database, a DSS database not only requires that the required data can be retrieved easily but also requires that the retrieved data can be flexibly converted into various internal data required by the decision support system. In addition, it also has functions for analyzing data, supporting memory, supporting all kinds of relationships and views, and so on. The DSS database system is generally composed of the following parts:

1) Data Analysis Module

Data analysis for the model run to prepare and organize data. It is actually a variety of source databases and a DSS database interface. The main content includes the source database aggregation and formation of subsets, the establishment of the DSS database for the model and the dialogue part of the use.

2) DSS database

It analyzes the data through the data analyzing part. The data from the source database are not all entered into the DSS database but are analyzed as needed.

3) Database Management System

It is used to provide the function of accessing the data in the library.

4) Data dictionary

Used to maintain the system's data definitions, type descriptions and data source descriptions.

5) Data Query Module

The data dictionary is used to interpret data requests from other subsystems and determine how to fulfill them. The data requests are elaborated to the database management system, and the results are then returned to the dialog subsystem.

3 System Agent key technology realization

3.1 Implementation of inter-agent communication mechanism

In the Multi-Agent college sports training management decision-making system, the blackboard model is used to realize the communication between Agents, and the communication between Agents is shown in Figure 3. When Agentl needs to communicate with Agent2, it first uses the communication module to send a request message to the blackboard. The blackboard accepts the request, sends a message to Agent2, and waits for a response. Agent2 receives the message sent by the blackboard and decides to decide with or without the blackboard based on its actual situation, and then sends the result of the decision to the blackboard, and the blackboard returns the result of the decision to Agnet2. The blackboard then returns the decision to Agnet2.

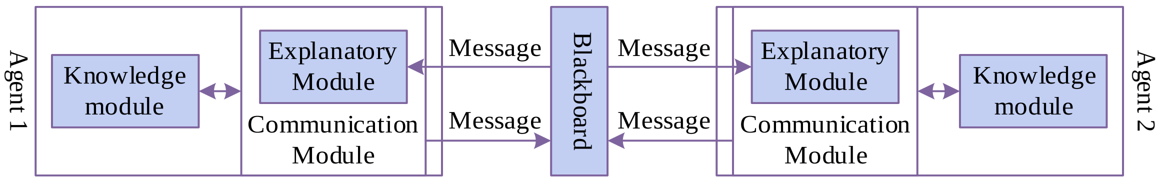

Figure 3. Communication function structure diagram between agents

Based on the Multi-Agent design, which corresponds to the Blackboard module, the agent can provide sufficient work scope to achieve the purpose of real-time exchange of data and information. At the initial stage of building Agent, a series of information items can be inputted on the blackboard, and the above information can be shared with other Agent modules and the blackboard can be accessed at any time to facilitate access to a large amount of valuable data and information. The agent selects its information through the filtering function, and the different Agent functions in the system do not communicate with each other, and each Agent can solve the subproblem independently. Each Agent is responsible for solving a sub-problem on their own.

3.2 Agent behavior modeling based on maximum information entropy model

Agent behavior includes state evaluation, decision-making, planning, etc. Agent behavior modeling encompasses the modeling of cognitive processes that are part of cognitive processing. Decision-making is the core of the process, and the decision-making process selects the best method from among different methods and executes it. The execution scheme's advantages and disadvantages can be determined by using the maximum information entropy model. In this paper's proposal, the binary feature function is utilized to express and process symbolic features, and there are many continuous features in the data set. Therefore, the information entropy-based discretization method is used to preprocess the dataset, and the CFS algorithm is used to select a suitable subset of features to form a data set for sports training of college students. Finally, the BLVM algorithm is utilized for parameter estimation to obtain the probability model in the form of an exponential that satisfies the maximum entropy constraints so as to determine the advantages and disadvantages of executing the decision-making scheme for college students' sports training management.

3.2.1 Maximum information entropy model

In this paper, the maximum information entropy model is applied to the college sports training management decision Agent system to determine the advantages and disadvantages of executing college sports training management decisions. Each training management decision is represented by set Ω, and the set consisting of all flows is represented by set V.

A feature vector represents each flow $v=\left(\tau_1,\tau_2,\cdots,\tau_k\right)$, $v\in V$. The training sample instances are represented by an ordinal pair consisting of a feature vector $v\in V$ and a classification marker $\omega\in\Omega$, $\langle v,\omega\rangle$, and the entire set of training samples can be represented as:

$$T=\left(\left\langle v_1,\omega_1\right\rangle,v_2\right\rangle,\left\langle\omega_2,\cdots,\left\langle v_i,\omega_i\right\rangle,\cdots,\left\langle v_N,\omega_N\right\rangle\right) \tag{1}$$

The subscript i here is only used to distinguish between different training samples, potentially:

$$\langle v_i, \omega_i \rangle = \langle v_j, \omega_j \rangle (i \neq j) \tag{2}$$

Where $V \times \Omega$ constitutes an event space on which a stochastic model is built to solve the problem of categorizing the unknown flow v', i.e., giving a conditional probability of $p(\omega | v')(\omega \in \Omega)$.

In conformity with the known information, the artificial subjective assumptions are removed, and the requirement of unbiasedness is satisfied so that the probability distribution of the unknown event is as uniform as possible, i.e., the entropy of the conditional information is maximized. To represent the known information, the concept of characteristic function is introduced:

$$f\langle v, \omega \rangle \to \{0,1\} \tag{3}$$

$f\langle v, \omega \rangle$ also referred to as features in the maximum information entropy model, given the training set T, an empirical probability distribution for instance $\langle v, \omega \rangle$ is obtained:

$$\tilde{p}(v, \omega) = \frac{\text{freq}(v, \omega)}{N} \tag{4}$$

The empirical expectation of the characteristic function k under the empirical distribution T is the statistic to be reproduced by the model:

$$E_{\tilde{p}} f = \sum_{v,\omega} \tilde{p}(v, \omega) f(v, \omega) \tag{5}$$

The model expectation of the eigenfunctions $E_p f = \sum_{v,\omega} p(v, \omega) f(v, \omega)$, it is usually possible to define a set of eigenfunctions $F = \{ f_i \}$. In order to make the model consistent with the training samples, a set of moment constraints is introduced:

$$E_p f_i = E_{\tilde{p}} f_i \tag{6}$$

There is more than one probability distribution that satisfies the above constraints, and the optimal solution is the one with the most uniform distribution, so the information entropy function can be used as the objective function:

$$H(p) = -\sum_{v,\omega} \tilde{p}(v) p(\omega | v) \log p(\omega | v) \tag{7}$$

$$p^* = \underset{p \in P}{\text{argmax}}\, H(p) \tag{8}$$

The solution that maximizes the information entropy of equation (8) is the optimal solution. Applying the Lagrange multiplier method to the solution, the solution in exponential form can be obtained as:

$$p^*(\omega | v) = \frac{1}{Z(v)} \exp\left(\sum_i \lambda_i f_i(v, \omega) \right) \tag{9}$$

where $Z(v)=\sum_{\omega}\exp\left(\sum_{i}\lambda_i f_i(v,\omega)\right)$ is the normalization factor. λ_i is the parameter to be determined.

3.2.2 Data pre-processing

The maximum information entropy model is suitable for dealing with discrete symbolic features and therefore requires discretization of these continuous attributes. Let there be k classification labels $C_1,\cdots,C_k,P(C_i,S)$ within the training sample set S denoting the empirical probability of C_i within set S, then the classification entropy of set S can be expressed as:

$$H(S)=-\sum_{i=1}^{k}P(C_i,S)\log_2\left(P(C_i,S)\right) \tag{10}$$

Let T be the segmentation point, which splits the features A, which have been sorted in ascending order, into two intervals, and the corresponding set of training samples S is also divided into two subsets S_1 and S_2.

The entropy of categorization information induced by the segmentation of training sample set S by T is denoted as:

$$H(A,T;S)=\frac{|S_1|}{|S|}H(S_1)+\frac{|S_2|}{|S|}H(S_2) \tag{11}$$

Thus, the partition point chosen is the one that minimizes $T:T_{\min}=\underset{T}{\operatorname{argmin}}\,H(A,T;S)$ for $H(A,T;S)$. Then the partition point that satisfies the above condition:

$$\operatorname{gain}(A,T;S)<\frac{\log_2(N-1)}{N}+\frac{\Delta(A,T;S)}{N} \tag{12}$$

Where N is the number of samples in set S. According to the MDL principle, the conditions $\operatorname{gain}(A,T;S)$ and $\Delta(A,T;S)$ for the end of recursion are, respectively:

$$\operatorname{gain}(A,T;S)=H(S)-H(A,T;S) \tag{13}$$

$$\Delta(A,T;S)=\log_2\left(3^k-2\right)-\left[k\times H(S)-k_1H(S_1)-k_2H(S_2)\right] \tag{14}$$

where k_i is the number of categorized labels in S_i.

3.2.3 Feature selection

Feature selection is the process of selecting a suitable subset of the feature space from the feature space and removing irrelevant and redundant features. In this paper, a correlation-based filter (CFS) is used for feature selection. CFS has better classification correctness and computational efficiency compared to other feature selection methods. Conditional information entropy can be used to measure the degree of correlation between features and classification and between features and features.

Let $H(X)$ be the information entropy of feature X, $H(X|Y)$ denote the conditional information entropy when other features or classes Y appear, and the information gain can be used to define the degree of correlation between X and Y as:

$$C(X|Y)=\frac{H(X)-H(X|Y)}{H(X)+H(Y)} \tag{15}$$

The following metrics can measure the plausibility of a subset of features:

$$G_{\text{subnet}}=\frac{k\overline{r}_{ci}}{\sqrt{k+k(k-1)\overline{r}_{ii}}} \tag{16}$$

Where k is the number of features in the feature subset, $\overline{r}_{ci}$ and $\overline{r}_{ii}$ respectively:

$$\overline{r}_{ci}=\sum_{X\in\text{subnet}}P(X|Y)\cdot C(X|Y) \tag{17}$$

$$\overline{r}_{ii}=\sum_{X,Y\in\text{subnet}}P(X|Y)\cdot C(X|Y) \tag{18}$$

Finally, the value of G_{subnet} is used as the basis for the best-first search method to obtain the desired subset of features.

3.2.4 Parameter estimation

To determine the maximum information entropy model, the model parameters must be estimated from the training samples λ_i. Denote by $\varphi(\lambda)$ the maximum value of the Lagrangian function for:

$$\varphi(\lambda)=-\sum_{v}\tilde{p}(v)\log Z(v)+\sum_{i}\lambda_i E_{\tilde{p}}\left(f_i\right) \tag{19}$$

Where λ is a parameter vector, $\lambda=\left(\lambda_1,\lambda_2,\cdots,\lambda_k\right)$, and λ^* satisfying $\lambda^*=\underset{\lambda}{\operatorname{argmax}}\,\varphi(\lambda)$ is the estimated parameter. In this paper, the LMVM algorithm is used to solve this unconstrained optimization problem, and its key step is to replace the Hessian matrix with an approximation matrix, and at the same time, the BFGS modification form is used to make the search direction approximate the Newton direction.

3.2.5 Behavioral modeling

According to the maximum information entropy model, assume that there exists n option that can be chosen, in the current state, applying the decision-making scheme is A_i, the possible states are S_j, and the utility value of each state is $U\left(S_j\right)$, with a probability of P_j. Then the expected utility value obtained by the decision is:

$$U\left(A_i\right)=\sum_{j=1}^{n}P_jU\left(S_j\right) \tag{20}$$

Compare the different expected utility values of each scenario, where the scenario that obtains the maximum expected utility is the best decision A, which is denoted as:

$$U(A) = MaxU\left(A_i\right) \tag{21}$$

3.3 Representation of System Knowledge Model Base and Reasoning Mechanisms

In the Multi-Agent-based university sports training management decision-making system, an object-oriented model is used to represent the model library, i.e., each model pair is regarded as an object to be stored and managed, and the if......then...... form is utilized to represent the sports knowledge, and the width-first search strategy and forward reasoning are used to realize its reasoning. Form to represent the sports knowledge, using the width-first search strategy and forward reasoning to realize its reasoning, the specific reasoning process is shown in Figure 4. It can be found that when reasoning, the user first searches the rule base thereby finding the set of rules that match the given facts, and then takes out a rule from it. If the antecedent of the rule is said to match the fact base, then the consequent of the rule is deposited in the fact base. Otherwise, the rule is deleted. The above process continues until all the rules have been processed and the final decision on sports training management is obtained.

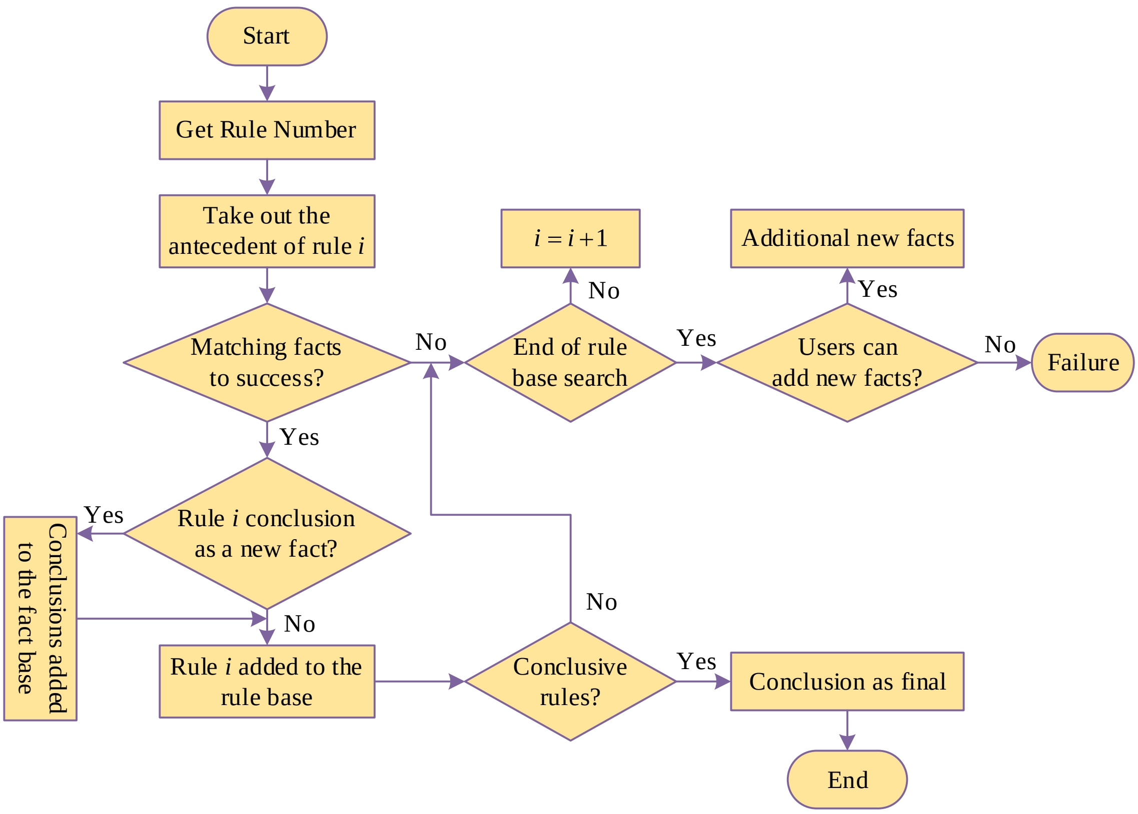

Figure 4. Inference flow chart

4 Empirical analysis of the Agent decision-making system for teaching physical education courses

In order to validate the reliability of the Agent system for teaching and training management decision-making in the physical education classroom under the college physical education curriculum model, five research members observed 20 video recordings of quality physical education classroom teaching under the college physical education curriculum model and used both intra- and inter-rater methods to test the reliability of the Agent system for training management decision-making in college physical education.

4.1 Agent behavior modeling analysis

The word frequency of college physical education subject words were counted by the co-word analysis method to determine the hot subject words in the research field of informationization construction of college physical education, which was verified by the cross-grouping of cluster analysis and multidimensional scale analysis of the dissimilarity matrix of the subject words. In this paper, a total of 150 theme words of college physical education informatization construction were obtained using SATI 3.0 software. According to the standard, the frequency of occurrence is not less than 5 times. A total of 38 theme words are obtained, as shown in Table 1. It can be seen that the frequency of wisdom education appears to be the highest, reaching 114 times. After determining the theme word categories of the hotspot accumulation of college physical education research, on this basis, by summarizing and generalizing the contents and characteristics of the theme word categories, the names of the constituent elements to be generalized are evaluated by experts, and the constituent elements of college physical education curriculum education are obtained.

Table 1. Summary of subject words in the research field of smart education

Serial number	Subject term	Time	Serial number	Subject term	Time
1	Wisdom education	114	20	Information technology	7
2	Smart campus	63	21	Age of wisdom	7
3	Intelligent environment	58	22	Management decisions	6
4	Intelligent learning	43	23	Micro lesson	6
5	Educational informatization	34	24	Electronic schoolbag	6
6	Big data	25	25	Teaching mode	6
7	Internet of Things	23	26	Cloud technology	6
8	Internet plus	19	27	Learning process	6
9	Smart classroom	15	28	Ubiquitous learning	5
10	Learning analysis	13	29	Intelligent technology	5
11	An intelligent curriculum	11	30	Intelligent management	5
12	Wisdom classroom	11	31	Data mining	5
13	Cloud computing	10	32	Cloud platform	5
14	Personalized learning	9	33	Intelligent environment	5
15	Educational big data	9	34	White master learning	5
16	Flipped classroom	8	35	Instructional design	5
17	Digital campus	8	36	Future classroom	5
18	Informatization	7	37	Educational practice	5
19	Artificial intelligence	7	38	Innovate	5

In this paper, the maximum information entropy model is used to cluster and analyze the 38 sports training subject words acquired by the Agent system, as shown in Figure 5. This study analyzes the clustering results as a tree and divides the 38 subject words into 6 categories based on their contents and features. By inputting the pre-processed data into the Agent system, the Agent system analyzes and evaluates the constituent elements of the corresponding fields of the six categories by formulating "names" and summarizes the constituent elements of the informatization construction of physical education in colleges and universities as the development strategy, basic support, curricular resources, learning environment, and big data monitoring and evaluation, service and management.

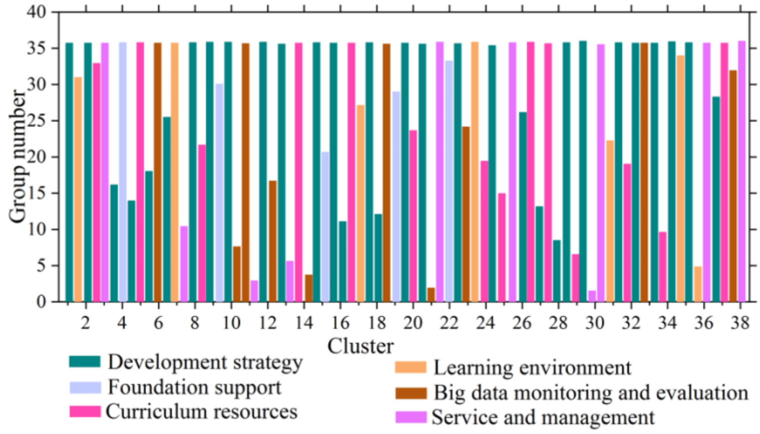

Figure 5. Cluster analysis of sports training subject words

Each topic word has a distinct network connection with other topic words, as demonstrated by the topic word similarity matrix. Based on the characteristics and functions of cluster analysis itself, it leads to the fact that each subject term can only be included in a class of clusters, with the closest failing to grasp the connection between the subject term and other subject terms. To analyze the attribute characteristics of the subject words more comprehensively and make a clear categorization of the community judgment on them. In this paper, we use SPSS19.0 analysis software to carry out multi-dimensional scale analysis on the 38 subject words obtained from the above word frequency analysis and obtain a visualized two-dimensional knowledge map as shown in Figure 6. It can be seen that the 38 subject words, which are clustered into 6 central feature points, which are (-1.28,1.35), (-1.43,-0.03), (-1.37,-1.58), (-0.48,1.51), (1.59,0.74), and (0.82,-1.38).

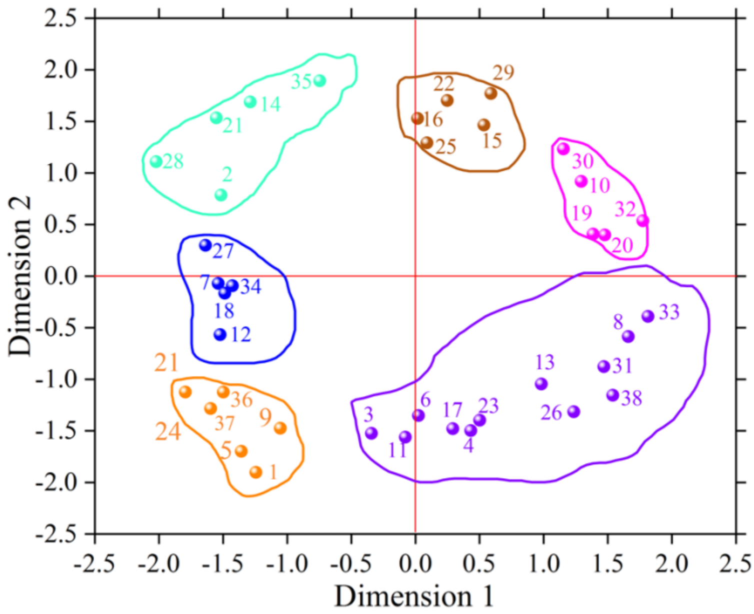

Figure 6. Visualization two-dimensional knowledge map of multidimensional scaling analysis

4.2 Empirical Test of Agent Decision Making System for Teaching Physical Education Courses

4.2.1 Reliability Analysis of Agent System for Physical Education Teaching Behavior

In this paper, 20 video recordings of quality physical education classroom instruction in the college physical education curriculum model were *Pearson r* correlated, analyzed by ANOVA, and two-way randomized within-group correlation analysis of the observed and recorded coding data the results are shown in Table 2. It can be seen that there was a positive correlation between the five observers' coded data, r =0.92 to 0.95, p < 0.01. The results showed that there was no significant difference between the five observers' coded data. The results of the reliability analysis illustrate that both inter-rater and intra-rater reflect good reliability, 0.92-0.95 for inter-rater and 0.94 for intra-rater.

Table 2. Results of analyzing system reliability parameters

Observer A/B/C	Pearsonr	F/P	ICC between raters	Rater within ICC
A×B	0.95**	0.00/1.00	0.95	–
A×C	0.94**		0.93	–
B×C	0.92**		0.92	–
C	–			0.94

Note: *p<0.05 **p<0.01.

4.2.2 Decision-making validity analysis of physical education behaviors

The objective is to verify the predictive reliability of the training management decision-making Agent system for teaching physical education classrooms in the physical education curriculum model. The mediating effect test was conducted on the observed and recorded data to verify whether the training management decision-making Agent system plays an important mediating role between physical education teacher behavior and student behavior.

In this study, the Bootstrap sampling method in the product coefficient test was used to test the mediating effects of physical education teacher behavior, interaction behavior and student behavior in the physical education curriculum model. The results are shown in Table 3. It can be seen that there are three models involved in the analysis of the mediating effect of physical education teacher behavior, interaction behavior and student behavior in the Agent decision-making system for teaching physical education courses, which are:

1) Student behavior = 0.47 + 0.45* teacher behavior, total effect c.

2) Interactive behavior = 13.37 + 0.23* teacher behavior, mediated effect process value a.

3) Student behavior = -8.37+0.29*Teacher behavior +0.53*Interaction behavior, direct effect c' and intermediate effect process value b.

Table 3. Results of mediation analysis

	Student behavior				Interactive behavior				Student behavior			
	B	*S.E*	*t*	*p*	*B*	*S.E*	*t*	*p*	*B*	*S.E*	*t*	*p*
Constant	0.47	7.15	0.05	0.94	13.37	3.18	6.37	0.00	-8.37	8.33	1.07	0.33
Student behavior	0.45**	0.05	7.37	0.00	0.23**	0.01	12.15	0.00	0.29**	0.07	3.13	0.00
Student behavior	—	—	—	—	—	—	—	—	0.53**	0.23	2.25	0.01
R^2	0.235				0.506				0.283			
Adjust R^2	0.255				0.498				0.270			
F	*F* (1056) =55.32				*F* (1056) =143.58				*F* (2237) =24.14			

The three mediation models obtained above were used to construct the results of the test of the mediating effects of physical education teacher behavior, interaction behavior and student behavior as shown in Table 4. It can be found that the difference between the total effect (c), the mediating effect process value (a) and the mediating effect process value (b) are significant. And the mediating effect (a*b) value is 0.17, which is the same number as the direct effect (c’). Where the 95% Boot CI for the mediating effect (a*b) does not include the number 0.

Table 4. Results of mediation tests

	Total effect	Intermediate effect		Mediating effect	(95% Boot CI)	Direct effect	Effect ratio
	c	a	b	a*b	a*b	c’	
Teacher Behavior →	—	—	—	—	—	—	
Interactive behavior →	0.45**	0.23	0.53	0.17	0.05~0.31	0.31**	33.85%
Student behavior	—	—	—	—	—	—	

Note: *p<0.05 **p<0.01.

Combining the above results, it can be concluded that the interaction behaviors under the college athletic training management decision-making Agent system play an important partial mediating role between physical education teachers’ behaviors and students’ behaviors, and the effect share is 33.85%. This suggests that the decision-making system for university sports training management may play an important mediating role between the behavior of physical education teachers and students.

5 Conclusion

At present, it is difficult for university physical education teachers to formulate a reasonable and effective training management plan that is relevant to the actual situation of the students themselves. This paper combines Multi-Agent intelligent optimization technology to design an Agent-based decision-making system for college sports training management. Through the empirical validation of the physical education course teaching Agent decision-making system, it is found that the analysis of the mediating effects of physical education teacher behavior, interaction behavior and student behavior in the physical education course teaching Agent decision-making system involves a total of three models. Among them, the total effect c, the mediating effect process value a and the mediating effect process value b are significant. The mediating effect a*b value is 0.17 with the same sign as the direct effect c’, and the 95% Boot CI of a*b does not include the number 0. It indicates that the interactive behavior under the Agent system of the college athletic training management decision-making system plays an important part in the mediating role between physical education teachers’ behavior and students’ behavior, and the effect share is 33.85%. The test results show that the system can make a reasonable and effective training plan according to the actual physical quality of the students, and it has certain application value in college students' physical education.

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